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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/529,904	04/01/2005	Masashi Ueda	269021US2PCT	5287

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EXAMINER	
MILLER, JR, JOSEPH ALBERT	

ART UNIT	PAPER NUMBER
1792	

NOTIFICATION DATE	DELIVERY MODE
01/27/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/529,904	UEDA ET AL.	
	Examiner	Art Unit	
	JOSEPH MILLER JR	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 January 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-7 and 9-15* is/are pending in the application.

4a) Of the above claim(s) *5,6 and 11-15* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 3, 4, 7, 9, 10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application.
6) ☐ Other: _____.

DETAILED ACTION

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 01/07/2010 has been entered.

Claim Observations

Instant claims require a microcrystalline structure, however, the microcrystalline structure is not limited in the instant claims to being directly from the forming step. The claim is 'comprising' and may include additional steps.

Examiner has rejected instant claims under the broad interpretation of the claims and, in order to effect compact prosecution, has also applied alternative art to teach what is believed to be applicant's intent.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1 and 7 are rejected under U.S.C. 103(a) as obvious over Ueda (WO01/19144, 6,719,876 used as translation) in view of Lohmeyer (2002/0127764) or, in the alternative, in view of Kaschmitter (5,456,763).

Ueda teaches using an array of electrodes to perform a film deposition (col 10, line 52- col 11, line 18). Ueda teaches that the electrodes function as antennas (col 5, lines 60-68) because the function of the electrodes meets the definition of an antenna, the electrodes therefore *are* antennas (there is no further definition of "antenna" that would prohibit such interpretation). The electrodes are comprised of two linear conductors (connected by a u-shape) (Figs. 1 and 3), one end ("second end of first linear conductors") of each (15 in Fig. 3) being connected to a high frequency generator (col 6, lines 23-36) and the "second end of the second linear conductors" being commonly grounded (col 11, lines 10-15).

Ueda further teaches multiple substrates arranged between multiple layers of the electrode (i.e. antenna) arrays (col 12, lines 17-64; Figs. 4 and 5) (i.e. "a plurality of substrates on both sides and in parallel to said array antennas").

Regarding the claim limitation that the respective distances between the substrates array antennas and the substrates (are) substantially similar to the intervals, the word "substantially similar" imparts no measurable metes and bounds on the exact distances, however, it could be argued firstly that, whatever the distances/spaces, they are inherently "substantially similar", secondly, Ueda teaches that the electrodes are formed with the same L2 (col 12, lines 16-40 and col 7, lines 12-51) and depicts (Fig. 5) substrates that are spaced evenly, therefore the fact that the elements (substrates and

linear conductors) are spaced evenly would make the defined spacings "substantially similar" in a broad sense of the term.

In alternative, it would have been obvious to someone of ordinary skill in the art at the time of the invention to space the substrates from the arrays at a distance comparable to the spacing between the linear conductors based on the dimensioning of the conductors. The conductors are formed such that their is a distance L2 between conductors based upon the wavelength and frequency applied (col 7, lines 12-55), in order to create a uniform plasma density in the space between the electrodes. Since the arrays are aligned in parallel in the embodiment taught, it would be obvious to carry over this same principal to create a uniform plasma between the electrodes of different arrays, therefore it would be obvious for the distances/spaces named to be comparable.

All required claim elements are taught except for the deposition of a crystalline silicon film; Ueda teaches deposition of an amorphous film.

Lohmeyer teaches that it is known to deposit an amorphous silicon layer and convert it to microcrystalline [0011] (also [0002-0026]).

Kaschmitter teaches a process for forming microcrystalline films from amorphous silicon films for solar cells (abstract, col 45-48).

It would have been obvious to someone of ordinary skill in the art at the time of the invention to deposit the amorphous film of Ueda and convert the film to a microcrystalline film as taught by Lohmeyer and/or Kaschmitter as it would help to decrease the degradation of the efficiency under intensive illumination as taught by

Lohmeyer [0009]. Kaschmitter implicitly teaches the preference of a microcrystalline silicon layer for a solar cell is known in the art (col 1, lines 14-32 and lines 50-59).

While Lohmeyer teaches the conversion of a film including hydrogen, examiner takes the position that Ueda's invention is not so limited by the statement of "amorphous silicon" that such modification would be obvious. Ueda makes only several statements about the silicon film being amorphous but does not discuss the structure in any detail.

Regarding claim 7, all elements are taught as described above; additionally, Ueda teaches that such a deposition may be applied to a solar cell (col 4, lines 52-55).

Claims 3 and 9 are rejected under 35 U.S.C. 103(a) as obvious over Ueda (WO01/19144, 6,719,876 used as translation) in view of Lohmeyer (2002/0127764) or in view of Kaschmitter (5,456,763) as applied to claims 1 and 7 above, respectively, and in further view of Takagi (WO 01/088221, 2004/0020432 used as translation).

The teachings of Ueda are described above. Ueda teaches the use of a chamber including antenna elements as electrodes used to generate a plasma to deposit a film on multiple substrates, but is silent on the process pressure.

Takagi teaches a plasma CVD apparatus where a number of electrode arrays (as shown in Figure 5; [0060-0063]) are arranged in a determined interval as shown in Figure 6 [0064-0066]. A plurality of substrates (items 11 in Fig. 6) is arranged on both sides and parallel to the electrode.

Takagi teaches an example of depositing an amorphous silicon film for use in a solar cell [0003; 0068-0070]. Takagi teaches an example where a deposition pressure of 1 Pa is used to deposit such a film [0070].

It would have been obvious to someone of ordinary skill in the art at the time of the invention to apply the use of a pressure of 1 Pa (or in that area) to deposit an amorphous silicon film for a solar cell as taught by Takagi to the solar cell deposition method of Ueda as one could apply such a pressure with a reasonable expectation of producing a film that would be viable for use in producing a solar cell. Ueda teaches specific interest in the production of amorphous silicon films (col 1, lines 6-14).

Claims 4 and 10 are rejected under 35 U.S.C. 103(a) as obvious over Ueda (WO01/19144, 6,719,876 used as translation) in view of Lohmeyer (2002/0127764) or in view of Kaschmitter (5,456,763) as applied to claims 1 and 7 above and in further view of Gillery (3,907,660)

Ueda's teachings are described above. Ueda teaches a method of deposition using an array of antenna elements but does not teach putting substrates in a reciprocation motion.

Gillery teaches a deposition method (abstract) where reciprocation of a substrate is used to improve the uniformity of a deposited film (col 4, line 64 – col 5, line 5).

It would have been obvious to someone of ordinary skill in the art at the time of the invention to apply the use of reciprocal motion of a substrate as taught in the

deposition method of Gillery with the deposition method of Ueda as it would allow one to improve the uniformity of the deposition (Gillery, citation). Ueda is clearly interested in producing uniform films on the substrates (background art, particularly col 2, lines 4-6, lines 26-29).

Claims 4 and 10 are rejected under 35 U.S.C. 103(a) as obvious over Ueda (WO01/19144, 6,719,876 used as translation) in view of Lohmeyer (2002/0127764) or Kaschmitter (5,456,763) as applied to claims 1 and 7 above and in further view of Nomura (5,993,614)

Ueda's teachings are described above. Ueda teaches a method of deposition using an array of antenna elements but does not teach putting substrates in a reciprocation motion.

Nomura teaches a method of depositing on a large substrate (abstract) using an antenna to generate a plasma (col 8, line 60 and item 112, Fig. 1). Nomura teaches that the substrate may be reciprocating within the chamber to allow deposition of multiple layers in a small chamber when using large substrates (col 20, lines 20-30).

It would have been obvious to someone of ordinary skill in the art at the time of the invention to apply the use of substrate reciprocation as taught by Nomura with the large substrate (Ueda, col 1, lines 10-14) deposition method of Ueda as it would allow for one to coat multiple layers on larger substrates in a given size (small) chamber.

Claims 1 and 7 are, in the alternative, rejected under U.S.C. 103(a) as obvious over Ueda (WO01/19144, 6,719,876 used as translation) in view of Sugiyama (2002/0022349) and Lohmeyer (2002/0127764) as additionally evidenced by Doehler (4,664,951), Saitoh (4,801,474), and Sharp (5,082,696).

Ueda teaches using an array of electrodes to perform a film deposition (col 10, line 52- col 11, line 18). Ueda teaches that the electrodes function as antennas (col 5, lines 60-68) because the function of the electrodes meets the definition of an antenna, the electrodes therefore *are* antennas (there is no further definition of "antenna" that would prohibit such interpretation). The electrodes are comprised of two linear conductors (connected by a u-shape) (Figs. 1 and 3), one end ("second end of first linear conductors") of each (15 in Fig. 3) being connected to a high frequency generator (col 6, lines 23-36) and the "second end of the second linear conductors" being commonly grounded (col 11, lines 10-15).

Ueda further teaches multiple substrates arranged between multiple layers of the electrode (i.e. antenna) arrays (col 12, lines 17-64; Figs. 4 and 5) (i.e. "a plurality of substrates on both sides and in parallel to said array antennas").

Regarding the claim limitation that the respective distances between the substrates array antennas and the substrates (are) substantially similar to the intervals, the word "substantially similar" imparts no measurable metes and bounds on the exact distances, however, it could be argued firstly that, whatever the distances/spaces, they are inherently "substantially similar", secondly, Ueda teaches that the electrodes are formed with the same L2 (col 12, lines 16-40 and col 7, lines 12-51) and depicts (Fig. 5)

substrates that are spaced evenly, therefore the fact that the elements (substrates and linear conductors) are spaced evenly would make the defined spacings "substantially similar" in a broad sense of the term.

All required claim elements are taught except for the deposition of a crystalline silicon film; Ueda teaches deposition of an "amorphous" film (col 1, lines 5-15).

Sugiyama teaches formation of an amorphous silicon film useful in solar cells (abstract, [0002]). Sugiyama teaches that the quality of the film can be controlled by controlling the power density (abstract, [0044-0049]). Sugiyama teaches particularly that certain settings that are used to form amorphous films can be changed and result in a microcrystalline film ([0048-49] in particular). Examiner takes the position that the formation of a microcrystalline or amorphous film is a matter of standard process optimization based on the teachings of Sugiyama.

Lohmeyer teaches that it is known to deposit an amorphous silicon layer and convert it to microcrystalline [0011] (also [0002-0026]). Lohmeyer teaches that a microcrystalline film is expected to have an improved degradation of the efficiency under intensive illumination as compared to an amorphous film [0009].

It would have been obvious to someone of ordinary skill in the art at the time of the invention to apply standard process optimization as taught by Sugiyama in order to effect a microcrystalline film as taught by Lohmeyer as it would be expected to reduce the degradation of efficiently under intensive illumination compared to an amorphous film as taught by Lohmeyer.

It is further noted that though Ueda teaches an amorphous film, it is not clear the limitations included in such a statement of an amorphous film.

Doehler (4,664,951) teaches the use of "amorphous" materials (including silicon materials for solar cells) where amorphous materials may include materials that include some crystalinity (col 1, line 36 – col 2, line 50).

Saitoh (4,801,474) teaches that formation of amorphous or polycrystalline silicon films, wherein the category of amorphous films includes "so-called microcrystalline" silicon (col 1, lines 17-58).

Sharp (5,082,696) specifically defines that amorphous includes both non- and microcrystalline materials but not including polycrystalline materials (col 2, lines 30-65).

While these teachings do not make obvious the formation of a microcrystalline film by Ueda, they lend support to a broader interpretation wherein Ueda could be construed as teaching non-polycrystalline film formation and therefore make obvious, in combination with Lohmeyer and Sugiyama, the formation of microcrystalline silicon films.

Regarding claim 7, all elements are taught as described above; additionally, Ueda teaches that such a deposition may be applied to a solar cell (col 4, lines 52-55).

Response to Arguments

Applicant's arguments with respect to instant claims have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments are limited to Ueda not teaching the formation of a microcrystalline layer. Examiner has provided several examples of the obviousness of forming such a layer by modifying the prior art.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOSEPH MILLER JR whose telephone number is (571) 270-5825. The examiner can normally be reached Mon - Thurs, 7am to 6pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks, can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/JOSEPH MILLER JR/
Examiner, Art Unit 1792

/Timothy H Meeks/
Supervisory Patent Examiner, Art Unit 1792